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**TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371**

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)
09/807410

INTERNATIONAL APPLICATION NO.
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INTERNATIONAL FILING DATE
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PRIORITY DATE CLAIMED
19th of October 1998

TITLE OF INVENTION
SEAT

APPLICANT(S) FOR DO/EO/US
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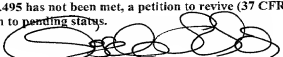
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☒ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☒ is attached hereto.
 - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☒ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A **FIRST** preliminary amendment.
14. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information:

*drawings of the PCT-Application
Credit Card Payment Form
a photocopy of the German priority publication
198.48.644.1 C (not certified)*

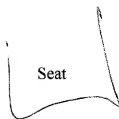
U.S. APPLICATION NO. 09/807410 INTERNATIONAL APPLICATION NO. PCT/DE 99/03352		ATTORNEY'S DOCKET NUMBER	
21. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. \$1000.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO. \$860.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO. \$710.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00 ENTER APPROPRIATE BASIC FEE AMOUNT =		CALCULATIONS PTO USE ONLY	
Surcharge of \$130.00 for furnishing the oath or declaration later than months from the earliest claimed priority date (37 CFR 1.492(e)). <input type="checkbox"/> 20 <input type="checkbox"/> 30		\$ 860.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	- 20 =		x \$18.00
Independent claims	4 - 3 =	1	x \$80.00
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00
TOTAL OF ABOVE CALCULATIONS =			\$ 1,210.00
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.			\$ - 605.00
SUBTOTAL =			\$ 605.00
Processing fee of \$130.00 for furnishing the English translation later than months from the earliest claimed priority date (37 CFR 1.492(f)). <input type="checkbox"/> 20 <input type="checkbox"/> 30			\$
TOTAL NATIONAL FEE =			\$ 605.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +			\$
TOTAL FEES ENCLOSED =			\$ 605.00
			Amount to be refunded: \$
			charged: \$
a. <input type="checkbox"/> A check in the amount of \$ _____ to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. _____. A duplicate copy of this sheet is enclosed. d. <input checked="" type="checkbox"/> Fees are to be charged to a credit card. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.			
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.			
SEND ALL CORRESPONDENCE TO Gisela Schon Mittelstrasse 51 D-52379 Langerwehe Germany		 SIGNATURE Gisela Schon NAME	
		REGISTRATION NUMBER	

ART 34 ANDT

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08/807410



The invention relates to a seat, in particular a seat with a stable base and with a sitting surface.

Different attempts have been made to provide seats, that support an ergonomic sitting posture, this in particular in connection with office chairs resp. seats for PC workstations. Thus there are for example rocking-chair-like constructions, seats with knee supports and seat-balls. All these seats however lead to relatively cramped sitting postures, since on the one hand the moving sitting surface has to be stabilized and on the other hand parts of the body, like shins, crucial ligaments and the tips of the foot are severely stressed in an unaccustomed way.

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Beyond that there are seats with forcibly driven sitting surfaces, as they are revealed for example in the DE 33 24 788 A1 in the EP 0 311 993 A2 and in the EP 0 574 073 A1. The seats shown there are however relatively limited in their sitting surface motion and usually only enable a shifting of the sitting surface into one direction, as for example upward and down with the EP 0 311 993 A2 respectively right-left-turning with the EP 0 574 073 A1.

Only the DE 33 24 788 A1 reveals a seat with a sitting surface, which is shiftable into two directions of motion, whereby this is managed by lifting devices which can raise the sitting surface, and in this connection the sitting surface can be raised and lowered parallel to itself respectively can be tilted laterally and circular.

In contrast to this it is object of the present invention to create a seat with a particularly ergonomically moved sitting surface.

The invention suggests a seat with the characteristics of patent claim 1.

Differently as with all known seats the body does not need to tense up to keep the sitting surface in position. The muscle work that is actually desirable with all known seats as well, is insured

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by the body being forced to follow the movement of the seat. In this connection the human body is already accustomed to such a following of a given movement from a child, for example by being carried by the mother, walking or riding. As everybody knows, such compulsory movements have a relaxing effect and can serve therapeutic purposes as well. The moved sitting surface shall not carry out a vibratory movement but a pleasant, calm and even movement. Additional vibratory movements would be conceivable.

It goes without saying that the amplitude of the motion is adapted in such a manner that it is possible to keep the upper part of the body nearly still. By continuously following the movement of the sitting surface with a nearly stationary upper part of the body very many muscles are kept busy during sitting without becoming cramped. The advantages of a sitting surface, that is forced to move continuously and cyclically, follow in particular, when the seat resp. the sitting surface are realized in a manner, that they encourage if not even enforce an upright sitting posture. Such sitting surfaces are actually well-known, for example a sitting surface may be used that is taken from a saddle shape. In particular, the sitting surface can be realized in a manner that an upright sitting posture with a straight back and an indicated hollow back can be taken up, in which the upper thigh is relieved of pressure.

Such an upright sitting posture with an appropriate selection of a sitting surface can be ensured by the fact that the sitting surface is shifted in its angle of

inclination. Favorably the shifting can take place in sitting direction as well as laterally. In particular it is also possible to rotate the sitting surface slightly relative to the horizontal. Likewise can be intended to shift the sitting surface in its height.

Means may be provided, which forcibly move at least one point of the sitting surface continuously and cyclically in at least two directions of motion periodically, whereby one period is larger, preferably twice as large as the other period. This way a movement resembling a gait movement can be simulated by relatively simple means, as it occurs when riding in alternating gait or ambling motion resp. when being carried. In particular it is possible that for the execution of such movements the sitting surface is tilted accordingly.

Beyond that, the seat can comprise a preferably stable foot and a sitting surface,

that may be shifted in its angle of inclination around a center of motion. By such an arrangement it is possible, independently of the other characteristics of the seat, to ensure on the one hand a body relieving movement while sitting and on the other hand an ergonomically favorable body posture regarding a workstation or a work-surface. Thus the stable base ensures, that a central position, for example in front of a monitor or a keyboard cannot be left, and still a slight body movement can be carried out – if self-induced or forcibly moved.

In particular it is possible as well, to shift the center of motion preferably in its distance to the sitting surface and/or in its distance to the base. By this on the one hand the change of the angle of inclination and on the other hand the height of the sitting surface can be influenced. The movement can also be developed in such a manner that not one specific center of motion can be defined and merely the inclination of the sitting surface may be altered.

In particular it is also possible, to carry out the shifting of the center of motion in dependence on the shifting of the sitting surface, so that the course of motion can be selected relatively freely for the sitting surface.

Regardless whether the change of angle of inclination of the sitting surface is carried out freely or by force, the sitting surface can be supported resiliently. This may be achieved for example by a spring element that is effective between the sitting surface mounting and the base. It is also possible to designate a suitable resilient guide for the sitting surface. By such a suspension, jerky movements are avoided which would on the one hand disturb an even course of motion as well as lead to tension, and on the other hand would have the consequence, that the compensating movement carried out subconsciously would become conscious in an unwanted way and so lead to a distraction from concentrated activity.

It goes without saying that the sitting surface does not necessarily have to be shiftable about a physically existing center of motion. Rather an appropriate guide

of the sitting surface can be intended, that shifts it about a virtual center of motion. Such a guide may be planned directly underneath the sitting surface itself, so that the complete base underneath the sitting surface can be carried out in a known way as a normal seat-base, if need be with casters or the like.

In particular the last-mentioned arrangement may be carried out as a footrest or as a stand instead of a sitting surface, that is located directly on the ground being forced to move continuously and cyclically. In this connection all previously described motion pattern can of course be realized for this footrest resp. stand and result in similar advantages. The sitting surface according to the invention is especially suitable for office chairs. With such application a stable base makes it possible in a particularly suitable way that a person remains in a prescribed position in correct posture in reference to a work surface resp. a computer. In particular the invention can be realized also in motor-vehicles resp. with car-seats. Here in particular it can successfully prevent fatigue symptoms during long rides. By switching the movement off in emergency situations here a hazard potential can be reduced. Likewise a seat according to the invention can be used with train driver's cabs resp. in airplanes and show the same advantages. Beyond that, it is possible to use a seat according to the invention as a reclining aid, when it is designed in a plain or flat way, or when it is integrated into a couch. In an application of such a kind, a seat according to the invention may be effective

against a Dekubitus. A seat according to the invention may be intended also in form of an armchair.

As already described above the sitting surface resp. also the footstool resp. the stand can be moved forward and backward, up and down as well as laterally. In particular however tumbling gyro-scope movements are possible as well, (like for instance with a Hula- or belly-dance) or tumbling up-down gyro-scope movements (like with a roller-coaster). Beyond that the sitting surface can execute a U-shaped side-alternating up-down-movement as well, like a horse in walk or a seesaw motion like a dromedary in ambling motion. A movement similar to a dolphin jump is possible as well, at which the sitting surface is being moved forward along an arc and then straight backward. It goes without saying, that other movements are conceivable as well, which can be selected especially in accordance to the well-being of the user or according to medical points of view as well.

In order to ensure the desired movements, all known drives, guides and transmissions may be used. So a desired movement may be generated for example by a sliding pin guided in a groove. In addition, it is possible to drive the sitting surface by an appropriate gear linkage. In particular an angular lever arrangement can be intended, by which - depending upon careful shaping and arrangement of the angular lever - most diverse motion patterns are able to be realized. In this respect, such an angular lever arrangement is of a relatively simple design and an

excessive use of bearings and mountings can be renounced. Likewise camshafts, eccentric cams or suitable, circular guides can serve as an influence on the motion cycle. By suitable combination of transmission elements resp. several transmissions or the like, switching between different motion patterns can also take place.

Preferably the sitting surface is tilted resp. designed such that a person in normal sitting position shows an angle of over 90 degrees between the upper part of the body and the thigh. This preferably applies to all operating inclinations of the sitting surface and ensures an easy upright sitting. For this, the sitting surface may be slightly tilted forward relative to the floor.

Leg supports shiftable with the sitting surface, may be intended at the seat. In particular, these leg supports can comprise at least one shank support, i.e. a supporting equipment for the lower part of the leg. Preferably, such a shank support comprises a support surface, supporting laterally. Such a laterally supporting support surface promotes an ergonomically favorable posture and likewise makes it possible that a stable sitting on the moving sitting surface is possible. An appropriate footrest can be connected to the shank support.

As desired these leg supports can be arranged in such a manner that they make a kind of lady's sidesaddle sitting or a kind of gentleman' sitting possible. Also a sitting with a crossed leg position resp. sitting slightly Indian style is conceivable.

In this connection it goes without saying that such leg supports can also favorably serve to a stable sitting and thus to an ergonomically favorable sitting posture independently of the other characteristics of the seat.

Moreover, the seat can comprise a backrest, whose support surface is shiftable independently of the sitting surface at least along a concave motion path. Here the term of the concave motion path defines a path of motion, that is laid out around a body, propped up at the backrest.

Such a backrest, shiftable independently of the sitting surface, whose degree of freedom is directed on the whole preferably perpendicularly to a vertical plane, makes it possible on the one hand, with the sitting surface being at a standstill, that the back area of a sitting person can be moved pleasantly within a certain clearance. With the sitting surface moving, on the other hand, the back and thus the upper part of the body can easily follow the sitting surface movement a little, without that there will be strains in the lower vertebral area.

Such a backrest, shiftable along a concave motion path is also favorable independently of the other characteristics of the seat. In particular, it is possible to

use this basic inventional idea as a back reclining device or as a head support resp. as a pillow. Here, the guide resp. the guiding means are supported resp. located accordingly horizontally, for example on a bed resp. in a couch. This too presents the advantage that the head resp. the upper part of the body can be pleasantly shifted or turned, without having to be raised. In particular, such a construction can also be used as pillows in a bed or on a couch, whereby in this case the concave motion path is laid out around the head. The head-rest resp. the pillow can also comprise a shoulder- resp. a backrest.

Also the backrest can be subject to a compulsory movement resp. fashioned drivable. Beyond that, the backrest may be continuously adjustable, in particular regarding the inclination. This applies in particular in connection with the use of such a backrest with couches resp. beds.

The seat may comprise arm supports, which are arranged resilient and shiftable independently of the sitting surface resp. the backrest at least in horizontal direction. In this connection the suspension can be planned horizontally as well as vertically. By the horizontal displacement, a large radius is attainable while being supported. The suspension serves on the one hand as a comfortable support and on the other hand as a reset into an initial position. Such arm supports are favorable independently of the other characteristics of the seat as well.

The sitting surface may be provided with a heating and/or a ventilation. Of course this also applies to a backrest or the remaining modules of a seating layout, like headrest, arm supports, footrests or the like.

At the seat a sensor can be intended for the control of the self-movement of the sitting person. This can be for example a strain gauge or a dynamometer. Beyond that it is also possible to merely check the power consumption of the seat drive. By such a sensor for the control of the self-movement of the sitting person, it can be detected whether the sitting person "sits positively" or whether he merely lazily follows the movement of the sitting surface. It is desired that the sitting person sits positively and follows the given movement of the sitting surface on his own account however unconsciously. It can be assumed that when sitting lazily the power to execute the movement supplied by the seat is accordingly larger. Accordingly also the power consumption of the drive will rise.

Beyond that the seat may provide means for the modification of the frequency and/or amplitude of the movement, so that the movement of the seat can be adapted to the way of sitting. During positive sitting for example the frequency and/or amplitude of the movement can be reduced to a minimum. However when the sitting person starts to sit "lazily", the amplitude and/or the frequency can then be modified accordingly, in order to stimulate positive sitting this way. Moreover,

when sitting lazily a signal can sound, like a honking signal, or music. By such an arrangement it is possible especially also with airplane- or car-seats or in driver's cabs of trains to reduce the danger of falling asleep, since in the case of falling asleep a transition from positive sitting to sitting lazily occurs.

Also such a seat is suitable for therapeutic purposes. In particular in this connection, a drive with single linear actuators offset against each other can be planned. For example this offset arrangement can happen in a way that is known with flight simulators. As driving means in particular servo-drives or pneumatic or hydraulic drives are applicable. In this connection the seat can particularly serve for the remobilization of persons after surgery of the lower extremities, for the strengthening of the back- and pelvis musculature and for a variable, flexible and thus not one-sided load on the intervertebral disks and for the digestion support with totally and partially paralyzed persons resp. the therapy of autistic or hyperactive persons.

Further advantages, objects and characteristics of the present invention are described on the basis of the following description of enclosed drawing, in which exemplarily several embodiments of a seat according to the invention are represented. In the drawing show:

Figure 1 a first seat with a sitting surface according to the invention in schematic sectional view,

Figure 2 a second seat with a sitting surface according to the invention in schematic side view,

Figure 3 the seat according to figure 2 in back view,

Figure 4 the drive mechanism of the backrest of the seat according to figure 2 and 3 resp. a headrest in schematic representation,

Figure 5 a third seat with a sitting surface according to the invention in schematic sectional view,

Figure 6 a fourth seat with a sitting surface according to the invention in schematic sectional view,

Figure 7 the seat according to Fig. 6 in schematic horizontal sectional view,

Figure 8 a fifth seat with a sitting surface according to the invention in a schematic cross section,

Figure 9 the seat according to Fig. 8 in a schematic profile,

Figure 10 a sixth seat similar to Figs. 6 and 7 with footrest in schematic frontal view,

Figure 11 the seat according to Fig. 10 with folded out footrest in a side view,

Figure 12 different sitting positions on the seat according to Figs. 10 and 11,

Figure 13 a seventh seat similar to the one according to Figs. 6 and 7 with
backrest and arm supports in a frontal view, whereby the arm supports
are depicted in a writing position,

Figure 14 the seat according to Fig. 13 in a side view,

Figure 15 the seat according to Figs. 13 and 14 in similar representation as Fig.
13, whereby the arm rests and a backrest are in a rest position, and

Figure 16 the seat according to Fig. 15 in a side view.

With the seat represented in figure 1 a sitting surface 1 is shiftable in its angle of inclination around a center of motion 3 provided between a stable seat base 2 and the sitting surface 1. This is ensured by the fact that a support pole 4, to which the sitting surface 1 is rigidly fastened, is supported at the base 2 by means of a supporting disk 5. Here the supporting disk 5 is movably supported to the base 2, so that the sitting surface is shiftable in an appropriate way, both in sitting direction and laterally.

The supporting disk 5 is supported at the base 2 by means of two elastic rings 6' and 6'', whereby the supporting disk 5 is supported on the lower elastic ring 6' and is held from the top by the second elastic ring 6''. As directly evident, this arrangement is already sufficient, to create a sitting surface 1 that is shiftable in the way according to the invention, which provides an upright rest position.

Furthermore the support pole 4 comprises a height adjustment 7 as well as a tilt adjustment 8, so that the seat can be adapted to individual needs.

As evident from figure 1, the support pole 4 could also be rigidly connected to the base 2, if an appropriate mechanism is provided directly under the sitting surface 1, that enables a shifting around the then virtual center of motion 3.

With the embodiment depicted in figure 1 a counter-plate 9 is intended at the end of the support pole 4 being opposite to sitting surface 1. This counter-plate 9 serves by its inert mass as a damping element, so that the movement of the sitting surface 1 will not be too easy running. Beyond that, spring elements 10 are intended at the counter-plate 9, which on the one hand serve as a vibration damper in support of the elastic rings 6' and 6'' and prevent on the other hand that the sitting surface 1 rotates around the support pole 4.

While the components described so far, ensure a free shiftability of the sitting surface 1 around the center of motion 3, the embodiment depicted in figure 1 furthermore comprises a drive 11, which is in an effect-related contact with the counter-plate 9 via an eccentric gear. Here, the gear is selected in such a manner that the sitting surface executes an U-shaped side-alternating movement.

As directly evident, it is also possible to mount the support pole 4 at the bottom of the base 2 and support it movable in the supporting disk 5. By contouring the bottom of the base 2 an U-shaped side-alternating high-/low-movement can then be achieved, like with a horse in walk.

The sitting surface 1 is selected here in such a manner that it enforces an upright posture with a straight back and indicated hollow back, whereby the thighs are released of pressure. This upright posture together with the passive following of the active compulsory movement resp. an appropriate compensating movement give the sitting person a feeling of security, without having a soporific effect, counteract muscle cramping and improve blood circulation in the entire body as well as improve digestion. The well cushioned motion causes a soft and gentle, varying load on the intervertebral disks. Here, the amplitude of the movement is selected in such a manner that head, shoulders and upper part of the body can easily be kept still.

An U-shaped side-alternating movement is of advantage in particular in connection with a rigid backrest, since with such a movement with each side-alternation the buttocks are moved away from the backrest, so that a movement of the buttocks, as well as the respective subsequent movement of the back reduces friction at the backrest and so does not lead to stress or tension with the backrest. This is of importance especially with the use as car-seats, airplane seats or driver's cabs of trains.

The seat depicted in figures 2 and 3 corresponds basically to the seat depicted in figure 1. However, with the former, yet two shank supports 12 are provided at the sitting surface 1, which are fastened to the sitting surface 1 by means of mounting devices 12'. On one hand the shank supports 12 provide laterally supporting outwardly directed supporting surfaces, which enable a sitting position similar to that of a horseman. Beyond that, the supports 12 also comprise one footrest each, so that the entire lower body can follow the moving sitting surface 1, while with the embodiment depicted in figure 1 the feet rest on the ground.

By means of the mounting devices 12' the supports 12 can also be adjusted in such a manner that a sitting position similar to a lady's side saddle or sitting slightly with folded legs is possible.

Beyond that, the seat according to figures 2 and 3 comprises a backrest, whose supporting surface 13 can be shifted along a concave motion path independently

of the sitting surface 1. For this, the backrest is fixed stationary regarding the base 2 of the seat by means of a base 14, and the supporting surface 13 may be shifted over a guide 15 in reference to the base 14. As evident in particular from figure 4, the guide 15 comprises a concave curved guide-way 17, along which travels a carriage 16 with the supporting surfaces 13. As is likewise comprehensible from this figure, the term of the concave motion path refers to the supporting surface 13 resp. to a body resting on this supporting surface. A construction as depicted in figure 4 can also find use as shoulder -, neck - or headrest resp. as a pillow. In particular, also a combination of head -, neck -, shoulder - and/or backrest is conceivable. Here, the form of the supporting surface is adapted to the head movement resp. to a body movement and the guide way is suitably supported.

So in the head area the supporting surface can be designed substantially thicker at the sides, so that when the body turns, the head is supported in a comfortable position in reference to that shoulder then situated below.

Beyond that, the supporting surface 13 of the backrest can be shifted resiliently along a diagonal guide-way 15', so that if need be the backrest resp. the supporting surface 13 can follow the movement of the sitting surface.

Beyond that, the seat according to figures 2 and 3 comprises a supporting lever 18, to which on the one hand lighting fixtures 19 and on the other hand forearm

supports 20 are fastened. The lighting fixtures are positioned in such a manner that a person sitting in this seat at a computer workstation (drawn by a broken line) is not dazzled.

The arm supports 20 are carried out as bent half shells and by means of suspensions 21 are attached resiliently at the supporting lever 18. Here, the suspensions 21 are fastened at the supporting lever 18 wider apart from each other than shoulder width. By this way, the supports 20 do not hinder, when not in use. Furthermore the supports 20 are suspended resiliently, whereby a pressure- resp. speed-depending lock is provided, so that the armrest 20 can be used as a support for rising out of the seat, when it is loaded jerkily.

As can be seen in figure 2, the person in a rest position can rest against the supporting surface 13 of the backrest, while also the sitting surface can be brought into a neutral position. In particular it is possible in this rest position to leave the arms in the forearm supports 20 so that they remain in a relaxed position, while the person is resting. By remaining in the forearm support it is ensured that an even blood circulation of the body is maintained, in particular to prevent too much blood accumulating in the arms.

It understands itself that such resilient arm rests can also be positioned resiliently from below or from the rear resp. the front and are also favorable independently of the other characteristics of the seat resp. the chair.

Here the long suspensions 21 provide a large area, within which the arms are supported freely movable. Thereby, neck tension may be avoided effectively.

The seat can also comprise a loin support resp. a neck support, which on the one hand - if need be - may be firmly connected with the sitting surface 1 or on the other hand may be fashioned independently of this sitting surface 1. In particular these may also be shiftable along a concave motion path, similarly to the backrest.

With the seat depicted in figure 5 the necessary mechanisms for the movement of the sitting surface 1' are positioned directly under the same in a housings 2'' supported on three legs 2'. Here, the sitting surface 1 is mounted on a support 4' so that it is able to wobble accordingly, by means of two elastic rings 6' and 6'' as well as several supporting springs 10'. An appropriate mounting plate of the sitting surface 1' embraces a support plate 5' at the support 4', over resp. under which the elastic rings 6' or 6'' are arranged. By this, the seat can be raised resp. shifted at its sitting surface 1' and nevertheless a movability according to the invention is ensured. The supporting springs 10' here also serve for resetting the sitting surface against an unwanted rotation of the same.

The elastic rings 6', 6'' could also be realized by an elastic ring resp. a tube positioned at the outer circumferential area.

With the embodiment depicted in figure 5, the forced movement of the sitting surface 1 ' according to the invention is ensured by a driven driving-ring 11 ', which rotates around the support 4 ' and which powers spacers 11 '' , that rotate on a guide way 11 ''' with the drive ring 11 '. The guide way 11 ''' is profiled so that a desired modification of the angle of inclination is achieved.

As is also directly evident from figure 5, a central supporting base may be used instead of the supports 2 ', like at a known desk chair. Likewise it is possible to completely do without the supports 2 ' and to arrange the arrangement on the ground or on a normal seat. Arranged on the ground or on a low stool, this arrangement can serve as a stand for standing, in particular during standing activities at machines or the like, or in addition, as a footrest. In particular it is also possible to combine such a footrest with the seats as depicted in figures 1 to 3.

The embodiment depicted in figure 5 also is suitable in particular for a chair/standing-stool combination, with the sitting surface being moved from a sitting position into a stand-sit-position of the user by means of a gas spring or similar lifting devices. In the sitting position a person can then take up a position for clerical work or the like, while the stand-sit-position is used for activities which can be carried out while standing too. The stand-sit-position may be intended offset to the sitting position in a way that in particular stand-sitting is

easily possible without restriction by a footrest or a low positioned work-surface.

By replacing the drive components, in particular the guide-way 11''' different courses of motion can be realized in a particularly simple way at an arrangement according to figure 5. Likewise another kind of drive may be conceivable. In particular a drive comprising of linear drives offset to each other may be used as well, as they find use for example with flight simulators.

Also the seats depicted in figures 6 to 9 have a sitting surface 1'' resp. 1''', which is shiftable around a center of motion. This center of motion however is shifted continuously with the movement of the sitting surface 1'' resp. 1''', so that the movement is better being described in its complexity in general.

While the movement of the sitting surface 1'' with the embodiment depicted in figures 6 and 7 corresponds best to the movement of a saddle on horseback, the movement of the sitting surface 1''' in the embodiment as depicted in Figs. 8 and 9 corresponds best with the movement of a saddle on an ambler.

Both seats are characterized by a sitting surface being forced to move continuously and cyclically, whereby means are intended, which shift a center of motion corresponding to the movement of the sitting surface. All known seats resp. devices according to prior art however show a fixed center of motion, which

can be shifted in its height if need be by means of control members that are lockable again, while it however remains in place during the rotary motion itself.

Beyond that both seats provide means, which force at least one point of the sitting surface 1'' resp. 1''' to move continuously and cyclically in at least two directions of motion periodically, whereby the period in one direction of motion is larger than the period in the other direction of motion. Preferably the one period is exactly twice as large as the other period. Thereby a seesaw- resp. a tilting motion can be achieved, how it is ultimately realized with the examples of embodiment depicted in figures 6 to 9.

In order to realize this, the embodiment depicted in figures 6 and 7 comprises two rocker arms 30 at the base 2'', which in each case support the sitting surface 1'' by a ball joint. The sitting surface 1'' beyond that, is supported by means of a support 31 likewise by a ball joint. The support 31 provides a gas pressure spring for height adjustment as well as for the increase of sitting comfort and is supported in a ball cup 32 preferably from nylon or a similar anti-friction material.

For comfort increase the seat comprises still beyond that additional upholstery 33, which is rigidly connected with the base 2'''.

The rocker arms are driven by means of a Bowden cable 35 led through reels 34 which is forced to move continuously cyclically by a motor 36, as well as by

return motion springs 37. By the cyclic raising of the toggle joints the sitting surface 1'' is shifted on the one hand with a certain frequency from right to left, whereby the exact position of the sitting surface 1'' is determined by geometry of the rocker arm 30 and support 31. With double frequency however the sitting surface 1'' beyond that is shifted to the front and to the back resp. in its height too, as is directly evident. In this way a rocking motion results similar to the one of a saddle on a horse, which has an extremely calming-down, even a therapeutic effect.

It understands itself that instead of the ball and socket joints also different joints, as for example toggle joints with sufficient clearance, or sufficiently rigid springs can find use.

The embodiment depicted in figures the 8 and 9 indicates for a realization however two rigidly connected ball bearing disks 41, which are mounted eccentrically and with an angle of inclination and which are arranged underneath the sitting surface 1''' and support it. The ball bearing disks 41 are rotary driven by a drive 42 and are supported on a shaft 43. Beyond that the sitting surface 1''' is secured against an unintentional tipping by a guide, that is not shown.

Through rotating the ball bearing disks 41, the sitting surface 1''' is stimulated into a rocking movement, which corresponds for instance to the motion of a saddle on an amble. Here, the sitting surface 1''' moves with half a revolution

of the ball bearing disks 41 from one side to the other, as depicted in figure 9. At the same time the sitting surface 1''' wobbles during this movement because of the eccentricity of the ball bearing disks 41 due to a twisted position, as evident in particular from Fig. 8. This wobbling motion shows the double frequency of the lateral movement.

Instead of the mechanical arrangements shown, different drives can find use as well. In particular means, which shift the center of motion according to the movement of the sitting surface, resp. means, which force at least one point of the sitting surface 1'' resp. 1''' to move continuously and cyclically in at least two directions of motion periodically, may additionally comprise control devices like electrical or electronic controls, and appropriate actuators or other driving means for the sitting surface and its angle of inclination.

The embodiment depicted in the figures 10 to 12 corresponds basically to the one depicted in figures 6 and 7. Here too a seat is intended with a sitting surface 1'' that is tilted slightly forward and executes a movement, which corresponds basically to a movement like when riding. This movement may be made possible by an arrangement which is corresponding to an arrangement according to figures 6 and 7.

Beyond that this seat comprises a recess 50, in which a leg-/footrest 51 is kept. The leg-/footrest comprises at least one upper supporting surface 52 for supporting one shank or both shanks as well as at least one lower supporting

surface 53 as a footrest, how this is shown in particular in figure 12. With this specific example of embodiment, for either leg a lower and an upper support surface 52, 53 are intended each. In this connection, as depicted in the present example of embodiment, the upper supporting surface 53 can be positioned, at least in part, at an angle relative to the lower supporting surface 52.

Like apparent in particular from figures 10 and 12 the leg-/footrest 51 comprises a mirror plane 55' (depicted in Fig. 10). In this mirror plane 55' the leg-/footrest 51 is movable relevant to the seat base 2''' resp. the sitting surface 1'', and - if desired - can be arrested at an angle position (see figure 12). This may be realized by a pole for example, being arranged within the leg-/footrest 51, that is positioned on the ground and on which the actual leg-/footrest 51 is mounted and can be arrested. In addition, there are other mounting plates resp. guides conceivable for the leg-/footrest 51. If required means to move the leg-/footrest 51 into another direction may be provided too.

As evident, with this seat only one leg-/footrest 51 is intended which is suitable for both legs. However also a leg-/footrest may be provided, which supports only one leg resp. only one foot. This may be for example a leg support in a vehicle, which supports only that leg, with whose foot an accelerator pedal is operated.

This support then effects the leg in a suitable way from the outer side.

With this embodiment the leg-/footrest 51 is connected to the seat by connecting devices 54, which enable folding the leg-/footrest 51 into or out of the recess 50. On the other hand it is also conceivable that the leg-/footrest 51 is arranged separately from the seat. Likewise the connecting devices 54 may permit another type of a relative motion between leg-/footrest and the rest of the seat like shifting or the like.

In order to facilitate folding out the leg-/footrest 51 a handle 55 is intended at its bottom, as figure 10 shows this.

Also, the seat depicted in figures 13 to 16 corresponds basically to the seat depicted in figures 6 and 7. With a seat depicted in figures 13 to 16 however a backrest 13 is intended, which is shiftable along a concave guide way 15. The guide way 15 is fastened to the supporting levers 56, which are connected at a cantilever 57 of the base 2''' with the base 2''' by a link joint 58. Optionally means for the arresting of the backrest and/or stops can be intended, which limit its movability. Beyond that, the backrest 13 may also be arranged swiveling around a center of motion designated on a level with the guide-way 15. It understands itself that a such arrangement of the backrest is also favorable independently of the other characteristics of the seat.

Beyond that, at the upper ends of the supporting levers 56 spring levers 59 are intended, to which the arm supports 60 as well as armrests 61 are fastened. The spring levers 59 are shiftable together with the backrest 13 between a writing position (see figures 13 and 14) and a rest position (see figures 15 and 16).

In the writing position the backrest 13 is tilted forward and supports the back only slightly, whereby by the U-shaped movement the buttocks of a sitting person are moved somewhat forward, when a sideways movement is in effect, so that especially a strain of the back area is avoided by the relative motion between back and backrest 13, even if the backrest 13 would be rigidly arranged, as this is the case for example with a motor vehicle. However because of the concave motion path of the backrest this doesn't make any difference with this seat.

Beyond that the spring levers 59 are outwardly curved in the writing position and embrace the levers as well as the arm supports 60 from the outside. Because of the suspension the person can move the arms nevertheless to different positions, without leaving the arm supports, so that the supporting function is maintained nevertheless.

In the rest position the spring levers 59 are turned about a center of motion at the upper supporting levers 56 and are located on them. Thereby the spring travel is shortened, so that the arm supports 60 are more rigidly supported. In this way they can be used as supports for rising.

Beyond that, the armrests 61 are then situated in a position for being used, and the person can lean back comfortably and relaxed. It understands itself that such a separate arrangement of the arm supports 60 can be favorable independently of the seat face 1' and the backrest 13. This also applies in particular to the centers of motion designated above the shoulders of a sitting person as well as to the arrangement of the arm supports 61 movable within limits in a writing position.

At this seat, beyond that a headrest can be intended too. It is preferably not directly connected to the backrest but is separately fastened to the seat in an appropriate way. Likewise lateral supports can be intended also, which support under the armpits, resp. a stomach- or a loin-support and/or a chin- resp. neck-support. The stomach-support resp. the loin-support can be implemented shiftable with a concave path of motion similarly to the backrest.

Patent Claims:

1. Seat with a base (2) and a backrest fixed stationary relative to the base (2) as well as with a sitting surface (1, 1', 1'', 1''') forcibly moved continuously and cyclically, said seat comprising means to forcibly move at least one point of the sitting surface (1, 1', 1'', 1''') continuously and cyclically in at least two directions of motion periodically, *characterized in that* the period of one direction of motion is larger than the period of the other direction of motion.
2. Seat according to claim 1, *characterized in that* said backrest comprises a support (13) that may be shifted about a guide (15) relative to said base (2).
3. Seat with a base (2) and a lumbar support fixed stationary relative to the base (2) as well as with a sitting surface (1, 1', 1'', 1''') forcibly moved continuously and cyclically, said seat comprising means to forcibly move at least one point of the sitting surface (1, 1', 1'', 1''') continuously and cyclically in at least two directions of motion periodically, *characterized in that* the period of one direction of motion is larger than the period of the other direction of motion.
4. Seat according to claim 3, *characterized in that* said lumbar support comprises a support (13) that may be shifted about a guide (15) relative to said base (2).

5. Seat with a base (2) and a shoulder support fixed stationary relative to the base (2) as well as with a sitting surface (1, 1', 1'', 1''') forcibly moved continuously and cyclically, said seat comprising means to forcibly move at least one point of the sitting surface (1, 1', 1'', 1''') continuously and cyclically in at least two directions of motion periodically, *characterized in that* the period of one direction of motion is larger than the period of the other direction of motion.
6. Seat according to claim 5, *characterized in that* said shoulder support comprises a support (13) that may be shifted about a guide (15) relative to said base (2).
7. Seat with a base (2) and a neck- or head-rest fixed stationary relative to the base (2) as well as with a sitting surface (1, 1', 1'', 1''') forcibly moved continuously and cyclically, said seat comprising means to forcibly move at least one point of the sitting surface (1, 1', 1'', 1''') continuously and cyclically in at least two directions of motion periodically, *characterized in that* the period of one direction of motion is larger than the period of the other direction of motion.
8. Seat according to claim 7, *characterized in that* said neck- or head-rest comprises a support (13) that may be shifted about a guide (15) relative to said base (2).
9. Seat according to one of the claims 1 to 8, *characterized in that* the larger period is chosen twice as large as the other period.

10. Seat according to one of the claims 1 to 9, *characterized in that* the sitting surface (1, 1', 1'', 1''') may be shifted in its angle of inclination as well in sitting direction as sideways.
11. Seat according to one of the claims 1 to 10, *characterized in that* the sitting surface (1, 1', 1'', 1''') may be shifted in sitting direction forward and backwards.

Literal translation of the abstract of the PCT Application:

Abstract

At a seat with a stable base the sitting surface is shiftable in its angle of inclination about a center of motion planned between the base and the sitting surface. Here the sitting surface is moved compulsorily continuously and cyclically.

Abstract as translated on the front page of the PCT Publication:

Abstract

The invention relates to a seat with a stable base wherein the angle of inclination of the seating surface can be moved around a pivot provided between the base and the seating surface, the latter being forced to move continuously and cyclically.

Abstract

At a seat with a stable base the sitting surface is shiftable in its angle of inclination about a center of motion planned between the base and the sitting surface. Here the sitting surface is moved compulsorily continuously and cyclically.

Fig. 1

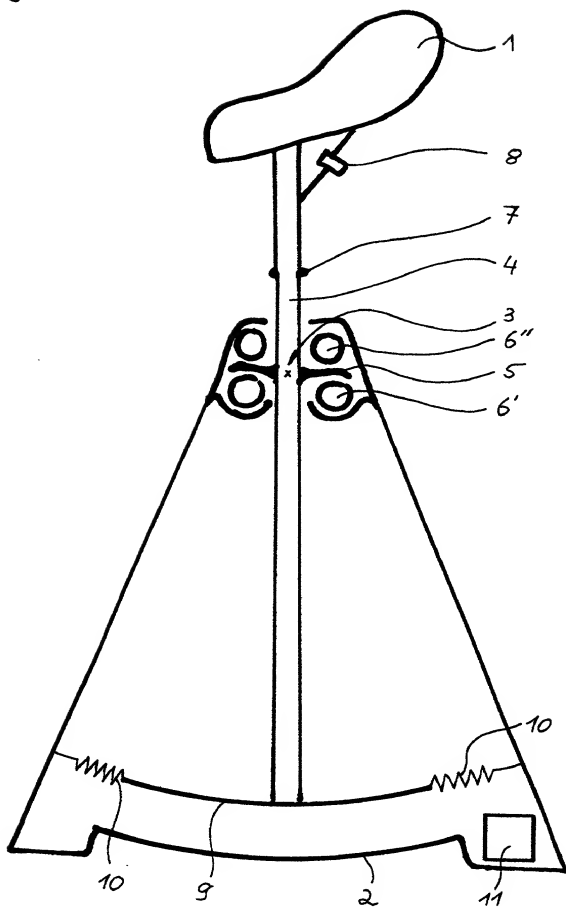


Fig. 2

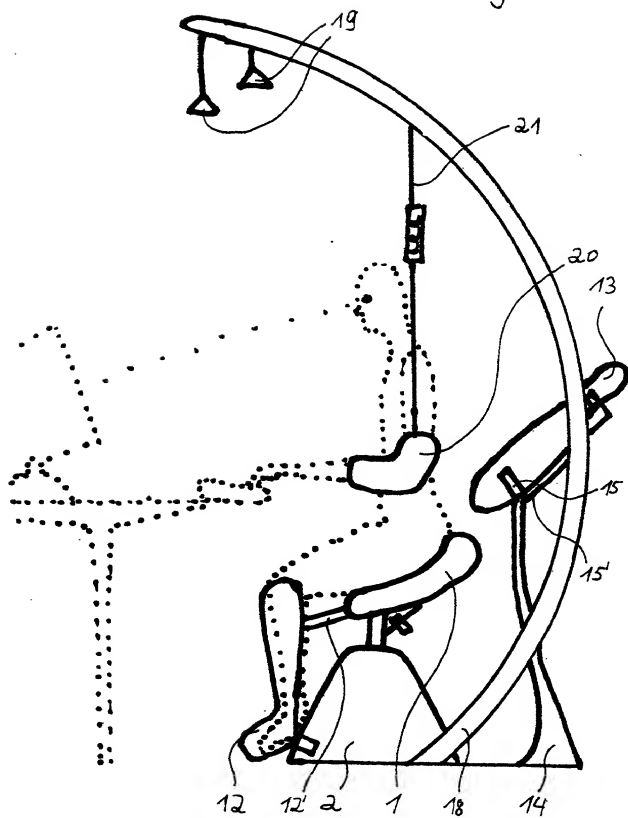


Fig. 3

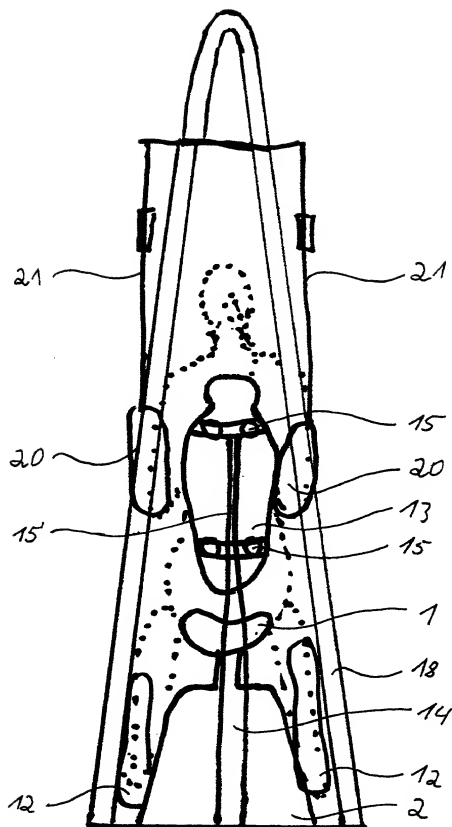


Fig. 4

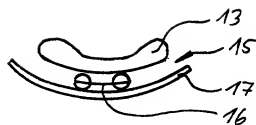


Fig. 5

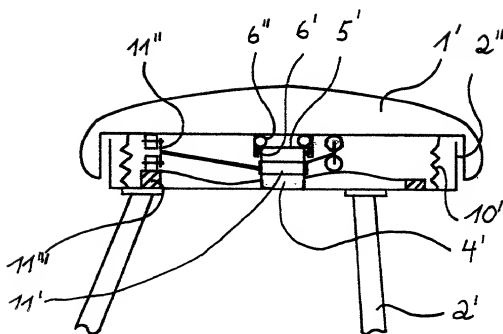


Fig. 8

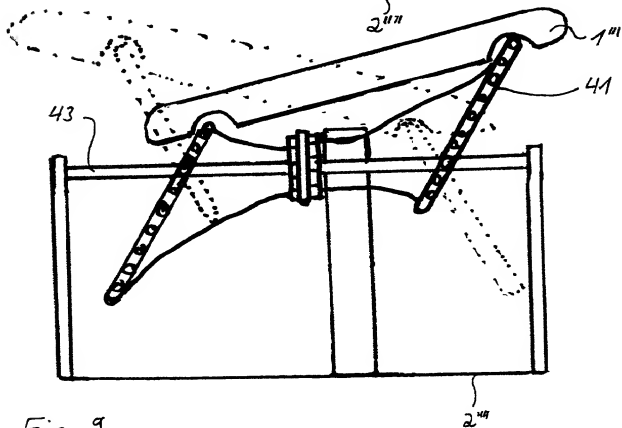
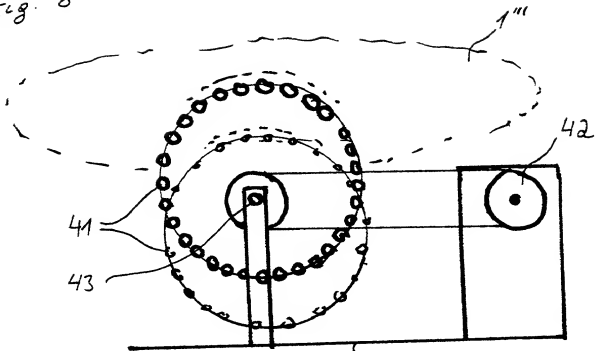


Fig. 9

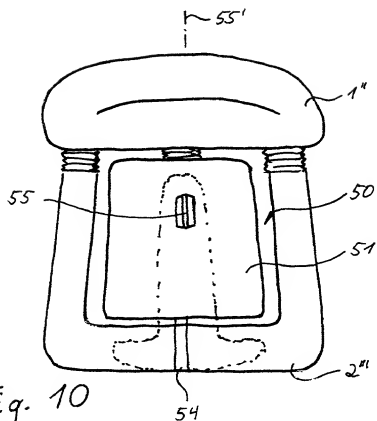


Fig. 10

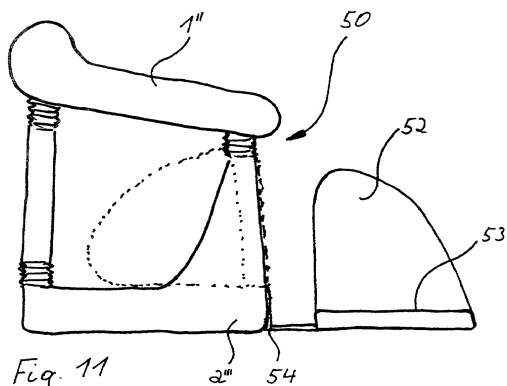


Fig. 11

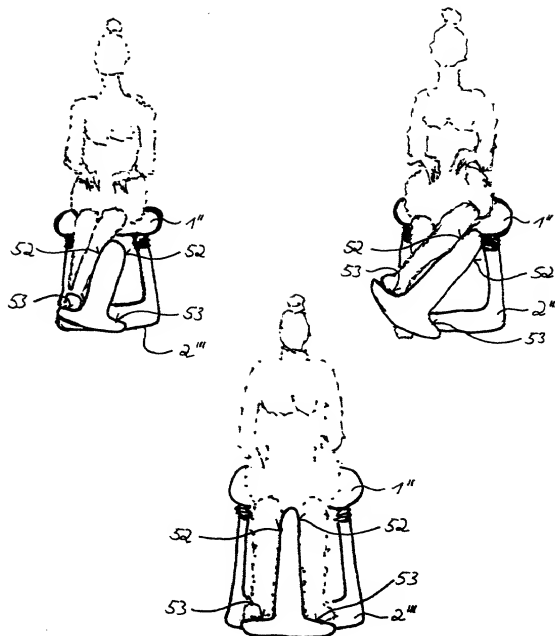
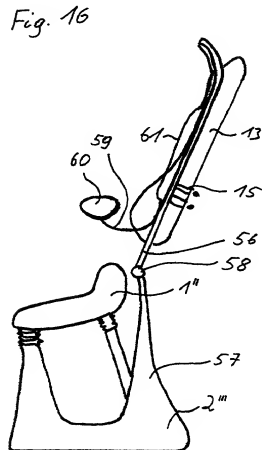
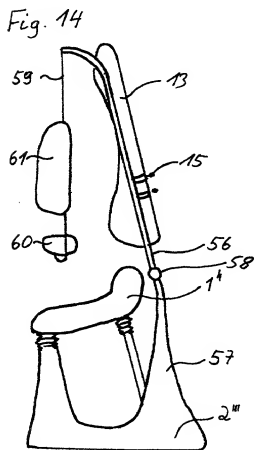
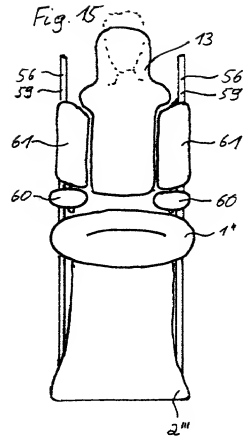
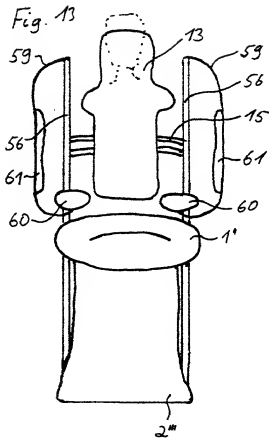


Fig. 12



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**DECLARATION FOR UTILITY OR
DESIGN
PATENT APPLICATION
(37 CFR 1.63)**

☒ Declaration Submitted with Initial Filing

OR

☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number**First Named Inventor**

Gisela Schon

COMPLETE IF KNOWN

Application Number

Filing Date

Group Art Unit

Examiner Name

As a below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Seat

(Title of the Invention)

the specification of which

☒ is attached hereto

and was originally

☒ was filed on (MM/DD/YYYY)

10.19.1999

as United States Application Number or PCT International

Application Number PCT/DE9903352 and was amended on (MM/DD/YYYY) (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
198 48 074.1	Germany	19. Oct. 1998	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Publication enclosed
198 50 529.9	Germany	3. Nov. 1998	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> dropped PCT
199 25 158.4	Germany	2. June 1999	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> dropped


☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

(Page 1 of 2)

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DECLARATION — Utility or Design Patent Application

Direct all correspondence to: <input checked="" type="checkbox"/> Customer Number or Bar Code Label		OR <input checked="" type="checkbox"/> Correspondence address below	
Name <u>Gisela Schon</u>			
Address <u>Mittelstrasse 51</u>			
City	<u>D-52379 Langerwehe</u>	State	<u>Germany</u>
Country	<u>Germany</u>	Telephone	<u>01149/2423-2664</u>
		ZIP	<u>D-52379</u>
<p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>			
NAME OF SOLE OR FIRST INVENTOR: <input type="checkbox"/> A petition has been filed for this unsigned inventor			
Given Name (first and middle [if any]) <u>Gisela</u>		Family Name or Surname <u>Schon</u>	
Inventor's Signature 		Date <u>16th of April 01</u>	
Residence: City	<u>Langerwehe</u>	State	<u>DE</u>
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		ZIP	<u>52379</u>
		Country	<u>Germany</u>
NAME OF SECOND INVENTOR: <input type="checkbox"/> A petition has been filed for this unsigned inventor			
Given Name (first and middle [if any])		Family Name or Surname	
Inventor's Signature		Date	
Residence: City	State	Country	Citizenship
Mailing Address			
City	State	ZIP	Country
<input type="checkbox"/> Additional inventors are being named on the ____ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto.			